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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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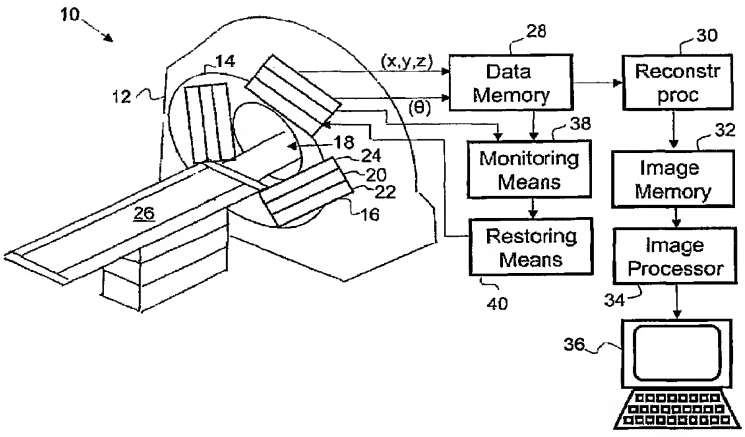
Declaration under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE,*

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR REVERSING PERFORMANCE DEGRADATION IN SEMI-CONDUCTOR DETECTORS



(57) Abstract: A system reverses degraded energy resolution of semiconductor radiation detection elements (44) which are used in a radiation detector assembly. A means (38) identifies semiconductor elements which exhibit degraded energy resolution as compared to an initial level of energy resolution after application of the forward bias. A means (40) restores the degraded semiconductor elements to the initial level of energy resolution by applying the reverse bias. A heater (74) accelerates the restoration process by supplying an elevated ambient temperature. A screening means (48) screens new semiconductor elements to identify the elements which are susceptible to degradation. A forward bias is applied by a forward bias means (50) to induce the degradation. A heater (52) increases an ambient temperature to accelerate the performance degradation in the new semiconductor. elements. The identified degradable elements are treated with a reverse bias prior to installation in the detector.

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EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

Published:

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB2004/052001

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01T1/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G01T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	OSINNSKI M ET AL: "Effects of proton irradiation on AlGaN/InGaN/GaN green light emitting diodes" ELECTRONICS LETTERS, IEE STEVENAGE, GB, vol. 33, no. 14, 3 July 1997 (1997-07-03), pages 1252-1254, XP006007673 ISSN: 0013-5194 The entire document	1,8,9, 13,21
A	US 4 013 485 A (MA ET AL) 22 March 1977 (1977-03-22) abstract column 1, line 40 - line 53 column 2, line 39 - line 59 figures	1,13

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 February 2005	06. 06. 2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Datta, S

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB2004/052001

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	HAMILTON W J ET AL: "VERY HIGH RESOLUTION DETECTION OF GAMMA RADIATION AT ROOM-TEMPERATURE USING P-I-N DETECTORS OF CDZNTE AND HGCDTE" RECORD OF THE NUCLEAR SCIENCE SYMPOSIUM AND MEDICAL IMAGING CONFERENCE SAN FRANCISCO, OCT. 30 - NOV. 6, 1993, NEW YORK, IEEE, US, vol. VOL. 1, 30 October 1993 (1993-10-30), pages 232-235, XP000481346 the entire document ----	2,8,21

INTERNATIONAL SEARCH REPORT

Information on patent family members

Interna[redacted]al Application No
PCT/IB2004/052001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4013485 A	22-03-1977	DE 2715982 A1	17-11-1977
		FR 2366695 A1	28-04-1978
		JP 52132680 A	07-11-1977

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2004/052001

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1, 2, 8, 9, 13, 21

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1,2,8,9,13,21

   A semiconductor element consisting of cadmium-zinc-telluride or cadmium-telluride crystals.

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2. claims: 3,4

   Reversing degradation of semiconductor elements by using reverse biasing.

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3. claims: 5-7,20

   A pre-use screening means for identifying degraded semiconductor elements.

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4. claims: 10-12

   A method for generating an alarm when the response of the detector signal degrads.

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5. claims: 14-19

   A pixel analyser to measure the radiation intensity distribution.
